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(54) Laminates With at Least One Microporous PTFE Membrane and End Products Produced From These Laminates

**Claims**

1.     Laminate with at least one microporous PTFE membrane, characterized by at least one layer of a flat textile fabric from man-made or natural fibers or a combination of these fibers, of  
- plastic foam,

- leather or leather substitute,
- paper or paper-like material,
- a gauze material or
- a plastic film.

2. Laminate according to Claim 1, characterized by the fact that the microporous PTFE membrane and/or the additional layer is refined, for example, finished, embossed, coated, printed, impregnated, chintzed, singed, shrunken, flocked, doctored, painted or dyed.
3. Laminate according to Claim 1 or 2, characterized by the fact that the textile fabric is woven, knitted, tufted, felted or veloured.
4. Laminate according to Claim 1 or 2, characterized by the fact that the plastic foam has open or closed pores and is coated with a plastic film or a flat textile fabric.
5. Clothing article, especially coat, overall or the like, made of a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate consists from the outside in of a layer of polyamide taffeta, a microporous PTFE membrane and a layer of polyamide tricot.
6. Clothing article, especially coat, anorak, pants, shirt or the like made of a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of polyamide taffeta, a microporous PTFE membrane and a layer of velour material.
7. Clothing article according to Claim 6, characterized by the fact that the velour material consists of polyamide, cotton or a blend of these materials.
8. Clothing article, especially coat, overall, cloak, suit or the like made of a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of layer of a mixed fabric of polyester and cotton, a microporous PTFE membrane, a layer of matted fiber of polyester and a layer of cotton tricot or velour.
9. Clothing article, especially coat or the like for the clinical area from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a microporous PTFE membrane and a layer of polyamide, cotton or polypropylene tricot.

10. Clothing article especially ski clothing article from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of an elastic or bielastic fabric, a microporous PTFE membrane and a layer of an elastic or bielastic fabric or tricot.
11. Clothing article according to Claim 10, characterized by the fact that the outer fabric consists of an elastomer and the inner tricot consists of cotton.
12. Shoe or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of leather or a leather substitute, a layer of polyamide tricot, a microporous PTFE membrane and a layer of polyamide tricot or velour.
13. Shoe or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of leather or a leather substitute, a microporous PTFE membrane and a layer of leather or leather substitute.
14. Sport shoe from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of polyamide oxford, a microporous PTFE membrane, a layer of chloroprene or PVC foam and a layer of polyamide or cotton tricot.
15. Glove of the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of fine leather, a microporous PTFE membrane and a layer of polyamide or cotton velour or tricot.
16. Glove or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of a combination of leather and a knitted fabric, a microporous PTFE membrane and a layer of polyamide or cotton knitted fabric.
17. Glove or the like for the clinical area from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a microporous PTFE membrane and a layer of polyamide, cotton or polypropylene tricot or velour.

18. Head covering, especially a cap, hood or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of a material with a fashion design, a microporous PTFE membrane and a layer of felt or leather substitute.
19. Swimming vest or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of polyamide ripstop, a microporous PTFE membrane, a layer of open-pore plastic foam, a microporous PTFE membrane and a layer of cotton or polyamide tricot, velour or fabric.
20. Swimming vest or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of polyamide taffeta, a microporous PTFE membrane, a layer of open-pore plastic foam and a layer of cotton or polyamide velour, tricot or fabric.
21. Sleeping bag or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of polyamide ripstop, a microporous PTFE membrane, a layer of polyester matted fiber and a layer of cotton or polyamide tricot or fabric.
22. Bivouac bag or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of polyamide fabric, a microporous PTFE membrane and a layer of polyamide or cotton velour.
23. Carrier, especially backpack, pouch, suitcase, briefcase or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of polyamide fabric, a microporous PTFE membrane and a layer of polyamide fabric or tricot.
24. Container for liquids or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of polyamide fabric and a microporous PTFE membrane.
25. Food container or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of polyamide fabric, a microporous PTFE membrane and a layer of polyamide fabric.

26. Tent canvas or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of polyester ripstop, a microporous PTFE membrane and a layer of cotton and/or polyester matted fiber.
27. Tarpaulins for vehicles, trailers, boats or the like from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of polyester fabric, a microporous PTFE membrane and a layer of polyester tricot or matted fiber.
28. Protective cover for animals from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a layer of polyamide fabric, a microporous PTFE membrane, a layer of polyester matted fiber and a layer of cotton or polyamide tricot or fabric.
29. Respiratory protection device for the clinical area from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a microporous PTFE membrane and a layer of polyamide, polyester or polypropylene fabric or gauze.
30. Covering material for the clinical area from a laminate according to one of the Claims 1 to 3, characterized by the fact that the laminate from the outside in consists of a microporous PTFE membrane and a layer of polyamide, polyester or polypropylene fabric, tricot or gauze.

#### Specification

The invention concerns laminates with at least one microporous PTFE membrane and end products produced from these laminates.

It is known that weatherproof clothing materials can be produced from flat impregnated textile fabrics or from flat plastic-coated textile fabrics. The impregnated materials are generally sufficiently breathable, but only conditionally watertight. The situation is reversed in plastic-coated materials, i.e., they are generally sufficiently watertight but only very conditionally breathable. In the search for a both watertight and breathable material microporous PTFE membranes have proven to be very useful, which are processed in a multilayered laminate into a weatherproof clothing material.

The task of the present invention is to further develop known laminates with at least one microporous PTFE membrane so that they can be used in different areas of application, for example, in the occupational, sports or clinical areas.

This task is solved according to the invention with laminates according to the characterizing part of Claim 1. The individual layers of these laminates can be refined or processed according to known methods.

Advantageous end products, like clothing articles, shoes, gloves, head coverings; sleeping bags, carriers, tarpaulins, etc. from laminates of specific composition are mentioned in the subclaims. These products (cf. also the following review table) are for protection against aggressive materials, like acids, alkalis or the like so that they can be advantageously used as protective clothing in the workplace. Their use in the military area because of their weather and cold protection and the protection against biological and chemical weapons is also very advantageous. Since PTFE is physiologically acceptable, these products can also be advantageously used in the clinical area. Other properties and areas of application of laminates according to the invention or end products produced from these laminates follow from the review table provided below.

The properties of the microporous PTFE membrane will be described concisely below. The microporous PTFE material for the membrane is produced in particular according to a process as known from DT-AS 21 23 316 or DT-OS 24 17 901. For example, the membrane has a thickness of only 0.025 mm and 1.4 billion pores per square centimeter. The maximum pore size is 0.2  $\mu\text{m}$ . PTFE is water-repellent. Because of this property and the limited pore size a very high pressure (of about 40 mH<sub>2</sub>O) is necessary in order to force water through the pores. Water drops are about 20,000 times larger than the pores of the microporous PTFE membrane. However, water vapor molecules are 700 times smaller than the pores. They can therefore diffuse through the membrane to a large extent. Laboratory and practical tests have confirmed this model. The microporous PTFE membrane is therefore both absolutely watertight and also breathable under all conditions occurring in practice.

Depending on the desired technical and aesthetic properties such a microporous PTFE membrane can be laminated on one or both sides with one or more layers of different materials. Lamination occurs according to the materials of the additional layers, for example, by means of adhesives, adhesion promoters, temperature and/or pressure.

The following materials can be used for these additional layers:

a) Man-made fibers, like viscose fibers, cupro fibers, acetate fibers, polyamide fibers, polyester fibers, polyacrylic fibers, polyacrylonitrile fibers, polyurethane threads, polyolefin fibers, polyvinyl alcohol fibers, polyvinyl cyanide fibers, polyvinyl chloride fibers, polytetrafluoroethylene fibers, two-component fibers or

natural fibers from cotton, flax, jute, ramie, coconut, wool, silk or the like or

combinations of natural fibers and man-made fibers in any ratios.

These materials can be processed in known fashion to flat textile fabrics, for example, by weaving, knitting, tufting, felting or velouring.

b) Foams with open or closed pores, for example, from PVC, polyurethane, polyethylene, polystyrene, chloroprene, etc.

c) Leather or leather substituents.

d) Paper or paper-like materials.

e) Gauzes, mesh or web materials.

f) Plastic films.

The laminates that are formed or the end products produced from these laminates combine in very advantageous fashion the aforementioned properties of the microporous PTFE membrane and the additional layers laminated on, like handle, softness and aesthetics of velour materials or the elasticity of foams.

Specific practical examples of laminates with their special properties, end products produced from these laminates and preferred areas of application are listed in the following review table. The layer structure of the laminate is always given in the sequence from the outside in. Since all laminates contain at least one microporous PTFE membrane, all products are naturally watertight and breathable. These properties are only particularly prominent in the laminates in which they are of special significance with respect to the end products and the area of use.

Item No.

Laminate

Special properties

End product

Area of use

1

- 70 g/m<sup>2</sup> polyamide taffeta

- microporous PTFE membrane

- 40 g/m<sup>2</sup> polyamide tricot

protection against corrosive media, like acids, alkalis or the like  
coat, overall

work, military

2

- 100 g/m<sup>2</sup> polyamide taffeta

- microporous PTFE membrane

- 80 g/m<sup>2</sup> polyamide velour

abrasion-resistant, skin-compatible, long-wearing, sealable  
anorak, overpants, poncho, snow shirt, head covering  
leisure, sport, work

3

- 80 g/m<sup>2</sup> polyester and cotton blend

- microporous PTFE membrane

- 100 g/m<sup>2</sup> polyester matted fiber

- 50 g/m<sup>2</sup> cotton tricot

heat-insulating, abrasion-resistant

anorak, overpants, poncho, snow shirt, head covering

mountaineering, work

4

- microporous PTFE membrane

- 45 g/m<sup>2</sup> polypropylene tricot

physiologically compatible, sterilizable

coat, apron

hospital

5

- 90 g/m<sup>2</sup> elastomer fabric

- microporous PTFE membrane

- 60 g/m<sup>2</sup> cotton tricot

bielastic, abrasion resistant watertight

ski clothing

skiing

6

- leather 2 mm thick

- 40 g/m<sup>2</sup> polyamide tricot

- microporous PTFE membrane

- 100 g/m<sup>2</sup> polyamide velour

protection against corrosive media like acids, alkalis or the like  
shoes, boots

work

- leather 1 mm thick

- microporous PTFE membrane

- leather 1 mm thick watertight breathable shoes, boots hiking, work

8

- 120 g/m2 polyamide oxford
  - microporous PTFE membrane
  - chloroprene foam 2 mm thick
  - 40 g/m2 polyamide tricot
- easy-care, watertight breathable  
sport shoe

sport

9

- fine leather 0.5 mm thick
  - microporous PTFE membrane
  - 60 g/m2 polyamide tricot
- watertight breathable

glove

work, sport

10

- combination leather 0.5 mm thick and  
100 g/m2 polyamide knitted fabric
  - microporous PTFE membrane
  - 80 g/m2 cotton knitted fabric
- heat insulating, abrasion resistant, watertight

glove

sports

11

- microporous PTFE membrane
  - 60 g/m2 polypropylene velour
- sterilizable, physiologically compatible, breathable

glove

hospital, research

12

- 80 g/m2 polyester and cotton blend
  - microporous PTFE membrane
  - 80 g/m2 cotton felt
- breathable, watertight, skin compatible, fashionable

head covering

every day, leisure

13

- 40 g/m2 polyamide ripstop
  - microporous PTFE membrane
  - PVC foam 4 mm thick
  - microporous PTFE membrane
  - 60 g/m2 polyamide tricot
- heat insulating, swim-compatible

swimming vest

work, sports, military

14

- 70 g/m2 polyamide taffeta
  - microporous PTFE membrane
  - polyester foam 6 mm thick
  - 80 g/m2 polyamide velour
- heat insulating, swim-compatible

swimming vest with tightly closing ties on the neck, arms, hips

sports, work, military

15

- 45 g/m2 polyamide ripstop

- microporous PTFE membrane

- 160 g/m2 polyester matted fiber

- 60 g/m2 polyamide tricot

heat insulating, watertight, breathable

sleeping bag

mountaineering, camping, military 16

- 60 g/m2 polyamide fabric

- microporous PTFE membrane

- 60 g/m2 polyamide tricot

abrasion resistant, light, watertight, breathable

bivouac bag

mountaineering, camping, military

17

- 100 g/m2 polyamide oxford

- microporous PTFE membrane

- 60 g/m2 polyamide fabric

light, tearproof, watertight, breathable

backpack, pouch, suitcase, briefcase

travel, sports, leisure, military

18

- 80 g/m2 polyamide taffeta

- microporous PTFE membrane

watertight, breathable, chemically inert, light

liquid container

travel, expedition, camping

19

- 80 g/m2 polyamide taffeta

- microporous PTFE membrane

- 60 g/m2 polyamide taffeta

watertight, breathable, abrasion resistant

food container

travel, camping

20

- 50 g/m2 polyester ripstop

- microporous PTFE membrane

- 40 g/m2 cotton matted fiber

UV resistant, light, watertight, breathable, tear-proof

tent canvas

camping, mountaineering, expedition, military

21

- 80 g/m2 polyester fabric

- microporous PTFE membrane

- 80 g/m2 polyester tricot

UV resistant, tear-proof, watertight, breathable

tarpaulins for vehicles, large tents, coverings

transportation, construction

22

- 60 g/m2 polyamide fabric

- microporous PTFE membrane
- 100 g/m2 polyester matted fiber
- 40 g/m2 polyamide tricot

heat-insulating, watertight, breathable, tear-proof  
protective shelters  
animal keeping

23

- microporous PTFE membrane
- 40 g/m2 polypropylene gauze

breathable, sterilizable, light, physiologically compatible  
respiratory protection device  
hospital

24

- microporous PTFE membrane
- 50 g/m2 polypropylene fabric

sterilizable, physiologically compatible  
coating material  
hospital

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